

WHAT IS CLAIMED IS:

- 1 1. An intake apparatus for an internal combustion engine,
2 comprising:
3 a main section defining an intake port having therein
4 first and second regions extending longitudinally of the
5 intake port; and
6 a recirculating section defining an intake recirculation
7 passage to recirculate part of intake air from the second
8 region in the intake port to an upstream position in the
9 intake port to strengthen an intake air stream in the first
10 region of the intake port.

- 1 2. The intake apparatus as claimed in Claim 1, wherein
2 the recirculation passage extends from a recirculation inlet
3 opened in a downstream end portion of the intake port, to
4 a recirculation outlet opened in an upstream portion of the
5 intake port, to take in part of the intake air before flowing
6 into a cylinder of the engine through an intake valve
7 provided at a downstream end of the intake port, and to
8 return the intake air to the upstream portion of the intake
9 port.

- 1 3. The intake apparatus as claimed in Claim 2, wherein
2 the intake apparatus further comprises a flow throttling
3 section to produce a low pressure region in the upstream
4 portion of the intake port; and the recirculation outlet of
5 the recirculation passage is opened to the low pressure
6 region produced by the flow throttling section.

- 1 4. The intake apparatus as claimed in Claim 3, wherein
2 the first region of the intake port is an upper region located

3 above the second region of the intake port, and the second
4 region of the intake port is a lower region located below
5 the upper region in an up-down direction of a cylinder of
6 the engine.

1 5. The intake apparatus as claimed in Claim 3, wherein
2 the main section includes an upper inside wall surface
3 which defines the first region in the intake port and which
4 includes a curved downstream end portion curved
5 concavely to guide the intake air stream along the upper
6 inside wall surface into a combustion chamber of a cylinder
7 of the engine, and a lower inside wall surface confronting
8 the upper inside wall surface and defining the second
9 region in the intake port.

1 6. The intake apparatus as claimed in Claim 3, wherein
2 the flow throttling section includes a throttle valve.

1 7. The intake apparatus as claimed in Claim 3, wherein
2 the flow throttle section includes a gas motion control valve
3 to close a part of the intake port.

1 8. The intake apparatus as claimed in Claim 1, wherein
2 the recirculation inlet is opened in an inside wall surface of
3 the intake port, and the recirculation passage extends
4 outside the intake port.

1 9. The intake apparatus as claimed in Claim 1, wherein
2 the recirculation outlet opens into the first region of the
3 intake port.

1 10. The intake apparatus as claimed in Claim 9, wherein
2 the recirculating section includes a pipe section projecting
3 into the intake port toward an inside wall surface defining
4 the first region of the intake port.

1 11. The intake apparatus as claimed in Claim 3, wherein
2 the recirculating section comprises a partition dividing the
3 intake port into a first passage section defining the first
4 region of the intake port, and a second passage section
5 serving as the recirculation passage.

1 12. The intake apparatus as claimed in Claim 11, wherein
2 the flow throttling section includes a gas motion control
3 valve to open and close an upstream end of the second
4 passage section of the intake port; and the recirculation
5 outlet is an aperture formed near the gas motion control
6 valve, for allowing a recirculation air to flow from the
7 second passage section to the first passage section.

1 13. An internal combustion engine comprising:
2 an engine block member defining an engine cylinder
3 and an intake port extending to the cylinder;
4 an intake valve to open and close a downstream end
5 of the intake port; and
6 a recirculating section defining an intake recirculation
7 passage to recirculate part of intake air to strength an
8 intake air stream flowing into the cylinder through a first
9 part of a downstream end portion of the intake port and
10 weaken an intake air stream flowing into the cylinder

11 through a second part of the downstream end portion of
12 the intake port when the intake valve is opened, the
13 recirculation passage extending from a recirculation inlet
14 opened in the downstream end portion of the intake port to
15 take in part of intake air from the second part of the
16 downstream end portion of the intake port, to a
17 recirculation outlet to discharge the intake air into an
18 upstream portion of the intake port upstream of the
19 downstream end portion to strengthen the intake air
20 stream through the first part of the downstream end
21 portion of the intake port.

1 14. An intake apparatus for an internal combustion engine,
2 comprising:
3 first means for defining an intake port having therein
4 first and second regions extending longitudinally of the
5 intake port; and
6 second means for defining an intake recirculation
7 passage to recirculate part of intake air from the second
8 region in a downstream end portion of the intake port, to
9 the first region in an upstream portion of the intake port
10 and thereby for strengthening an intake air stream in the
11 first region of the intake port.